National Resources Inventory
2003 Annual NRI

Soil Erosion

May 2006

About the Data

Estimates presented here are based upon the latest information from the National Resources Inventory (NRI). The NRI is a longitudinal sample survey based upon scientific statistical principles and procedures. It is conducted by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS), in cooperation with Iowa State University's Center for Survey Statistics and Methodology.

These results are based upon the 2003 Annual NRI, which statistically updates 1997 NRI results with data collected during 2000 – 2003. The NRI was conducted on a five-year cycle during the period 1982 to 1997, but is now conducted annually. NRI data were collected every five years for 800,000 sample sites; annual NRI data collection occurs at slightly less than 25 percent of these same sample sites.

NRI data release procedures are affected by implementation of an annual data collection approach, because the scale of NRI estimates is affected by these reduced sample sizes.

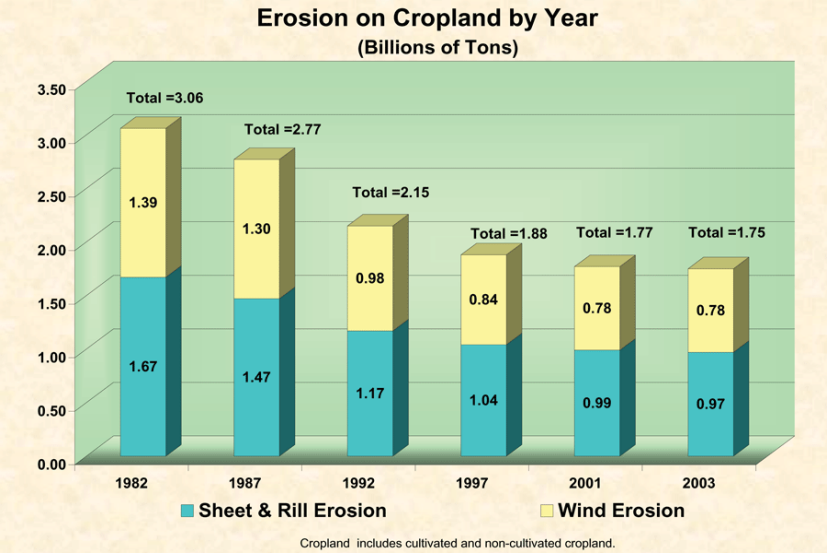
The National Resources Inventory (NRI) is a statistical survey of natural resource conditions and trends on non-Federal land in the United States -- non-Federal land includes privately owned lands, tribal and trust lands, and lands controlled by State and local governments.

Soil erosion involves the breakdown, detachment, transport, and redistribution of soil particles by forces of water, wind, or gravity. Soil erosion on cropland is of particular interest because of its on-site impacts on soil quality and crop productivity, and its off-site impacts on water quantity and quality, air quality, and biological activity. For this analysis cropland includes cultivated and non-cultivated cropland.

The NRI provides nationally consistent statistical data on erosion resulting from water (sheet and rill) and wind processes on cropland for the period 1982 - 2003.

Key Findings

- Between 1982 and 2003, soil erosion on U.S. cropland decreased 43%. Sheet and rill erosion on cropland in 2003 was down to 971 million tons per year, and erosion due to wind was at 776 million tons per year.



About the Data, cont.

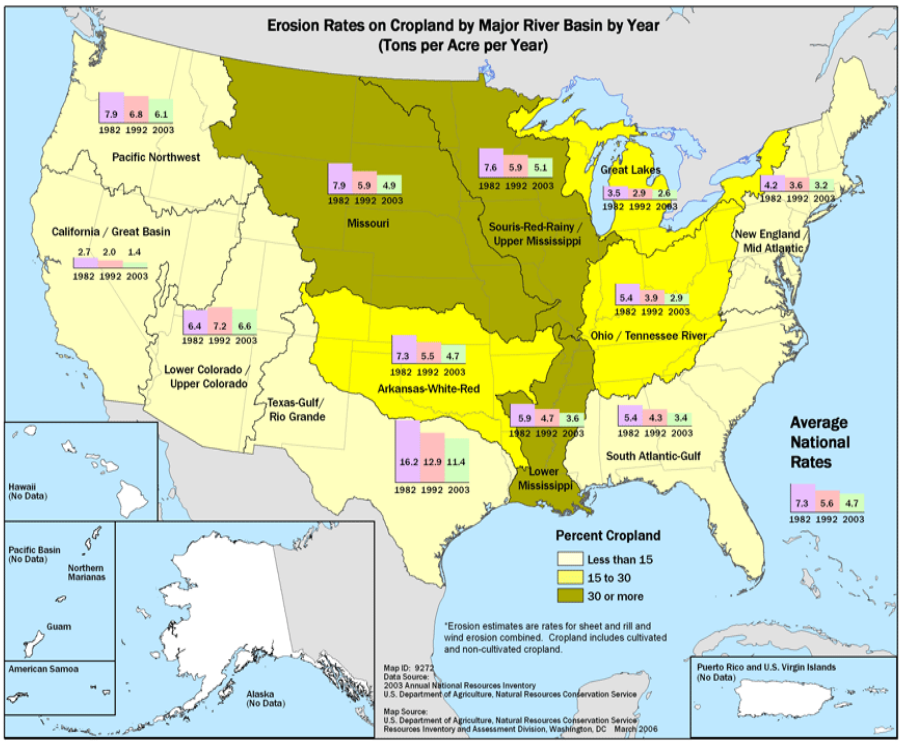
Estimates are being released when they meet statistical standards and are scientifically credible in accordance with NRCS policy, and in accordance with OMB and USDA Quality of Information Guidelines. The 2003 Annual NRI data are suitable for national and many regional level analyses. Data are currently being evaluated to determine suitability for release of a few selected state level estimates. As each successive annual NRI is conducted, more results will become available for regional, state, and eventually sub-state level analyses.

Current estimates cover the contiguous 48 states. Future estimates will also cover Hawaii, Alaska, the Caribbean, and selected Pacific Basin islands.

The findings presented here cover two types of erosion:

1. Sheet and rill erosion - the removal of layers of soil from the land surface by the action of rainfall and runoff; it is the first stage in water erosion.
2. Wind erosion - the process of detachment, transport, and deposition of soil by wind.

- Due to climatic factors, soil characteristics, landscape features, and cropping practices, soil erosion is concentrated in several Major River Basins.
    - Sheet and Rill erosion (2003) - 51% occurred in just two of the twelve Major River Basins -- the Missouri and the Souris-Red-Rainy/Upper Mississippi.
    - Wind erosion (2003) - 88% occurred in just four of the twelve Major River Basins -- the Missouri, the Souris-Red-Rainy/Upper Mississippi, the Arkansas-White-Red, and the Texas-Gulf/Rio Grande. The Texas-Gulf/Rio Grande basin has the highest wind erosion rates in the country.
    - Total erosion amounts continue to decline across all Major River Basins with the most significant reductions occurring in the Missouri and the Souris-Red-Rainy/Upper Mississippi.



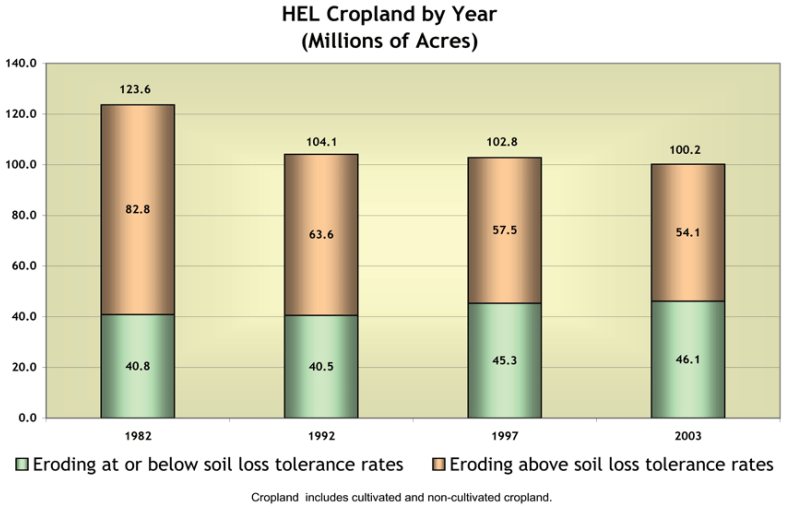
- Erosion rates on a per acre basis declined significantly between 1982 and 2003. Sheet and rill erosion on cropland dropped from 4.0 tons per acre per year in 1982 to 2.6 tons per acre per year in 2003; wind erosion rates dropped from 3.3 to 2.1 tons per acre per year.
- Declines in soil erosion rates have moderated somewhat since 1997, but the general downward trend in both sheet and rill and wind erosion continued through 2003.

About the Data, cont.

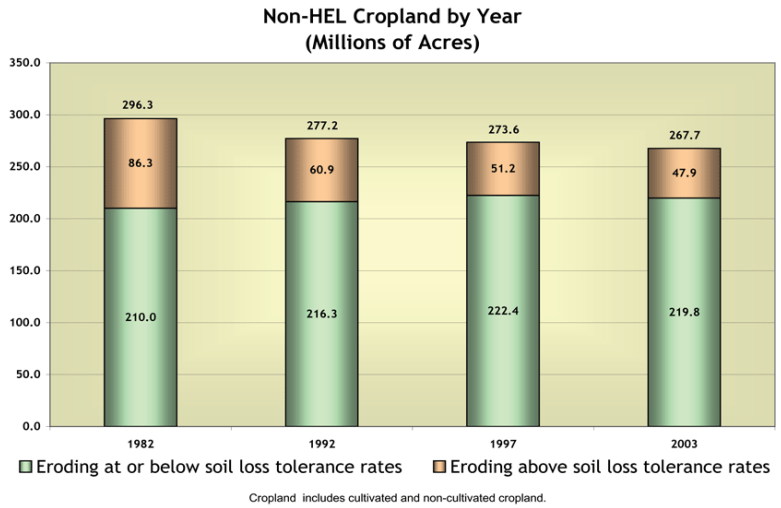
Erosion rates computed from NRI data are estimates of average annual (or expected) rates based upon long-term climate data, inherent soil and site characteristics, and cropping and management practices. These estimates come from factors that are determined for the portion of a field associated with an NRI sample site. The factors are used in two erosion models: 1) the Universal Soil Loss Equation (USLE) and 2) the Wind Erosion Equation (WEQ). The factors for these erosion prediction equations are determined for each NRI sample site that is cropland, pastureland, or land enrolled in the Conservation Reserve Program.

The erosion equation factors are also used to determine an Erodibility Index (EI) for these NRI sample sites. This index is a numerical expression of the potential of a soil to erode, considering climatic factors and the physical and chemical properties of the soil – the higher the index, the greater is the investment needed to maintain the sustainability of the soil resource base if intensively cropped. Highly Erodible Land (HEL) is defined to have an EI of at least 8.

- In 2003, 102 million acres (28% of all cropland) were eroding above soil loss tolerance rates. This compares to 169 million acres (40% of cropland) in 1982.
- In 2003, 266 million acres (72% of cropland) were eroding at or below soil loss tolerance rates. This compares to 251 million acres (60% of cropland) in 1982.
- In 2003, Highly Erodible Land (HEL) cropland acreage was about 100 million acres, compared to 124 million acres in 1982. HEL cropland acreage eroding above soil loss tolerance rates declined 35% between 1982 and 2003.



- Non-HEL cropland acreage eroding above soil loss tolerance rates decreased by 45% between 1982 and 2003.



About the Data, cont.

The NRI approach to conducting inventories facilitates examination of trends in erosion over time because –

- the same sample sites have been studied since 1982
- the same data have been collected since 1982 [definitions and protocols have remained the same]
- quality assurance and statistical procedures are designed/developed to ensure that trend data are scientifically legitimate and unambiguous.

Irrespective of the scale of analysis, margins of error must be considered. Margins of error (at the 95 percent confidence level) are presented for all NRI estimates.

- Gains in erosion control continue to occur even though the cropland base is continually changing. Significant acreages of cropland are retired or converted to other land uses, and land not previously cropped is being converted to cropland.

Importance to the Nation

Soil erosion impacts soil quality, health, and productivity, as well as the environment. The economic impact of mitigating soil erosion significantly burdens the agri-business sector and the Nation as a whole.

Dust contributions to the atmosphere and delivery of sediment, nutrients, and chemicals to water resources are primary environmental concerns addressed by public policy makers and the stewards of our working lands.

Understanding and managing these processes has important long term implications for cropland sustainability, natural resource condition and health, and environmental quality.

More Information

For more information about the NRI, visit http://www.nrcs.usda.gov/technical/NRI/.

See the 2003 Annual NRI Glossary for definitions of key terms.

To obtain State and local 1997 NRI data, contact your NRI coordinator. Links to State NRI websites and contact information can be found at:

http://www.nrcs.usda.gov/technical/NRI/1997/obtain_data.html .

Send comments and questions to the NRI Help Desk, nri@wdc.usda.gov.

Sheet and Rill Erosion on Cropland by Year with Margins of Error

Year	Million Tons per Year	Tons per Acre per Year
1982	1,671.8 ± 21.1	4.0 ± 0.1
1987	1,470.8 ± 19.0	3.6 ± 0.1
1992	1,168.8 ± 16.3	3.1 ± 0.1
1997	1,039.1 ± 11.9	2.8 ± 0.1
2001	992.4 ± 14.5	2.7 ± 0.1
2003	970.6 ± 14.7	2.6 ± 0.1

Wind Erosion on Cropland by Year with Margins of Error

Year	Million Tons per Year	Tons per Acre per Year
1982	1,389.6 ± 38.0	3.3 ± 0.1
1987	1,295.5 ± 36.3	3.2 ± 0.1
1992	985.3 ± 33.3	2.6 ± 0.1
1997	837.9 ± 28.9	2.2 ± 0.1
2001	780.1 ± 27.3	2.1 ± 0.1
2003	776.4 ± 24.3	2.1 ± 0.1

HEL Cropland in Millions of Acres by Year with Margins of Error

Year	At or below Soil Loss Tolerance Rates	Above Soil Loss Tolerance Rates	Total
1982	40.8 ± 1.2	82.8 ± 1.3	123.6 ± 1.4
1992	40.5 ± 1.0	63.6 ± 1.3	104.1 ± 1.3
1997	45.3 ± 1.3	57.5 ± 1.2	102.8 ± 1.2
2003	46.1 ± 1.3	54.1 ± 1.0	100.2 ± 1.2

Non-HEL Cropland in Millions of Acres by Year with Margins of Error

Year	At or below Soil Loss Tolerance Rates	Above Soil Loss Tolerance Rates	Total
1982	210.0 ± 2.2	86.3 ± 1.6	296.3 ± 2.0
1992	216.3 ± 2.1	60.9 ± 1.6	277.2 ± 1.9
1997	222.4 ± 1.8	51.2 ± 1.4	273.6 ± 1.8
2003	219.8 ± 2.0	47.9 ± 1.4	267.7 ± 2.0

Sheet & Rill Erosion on Cropland by Major River Basin by Year with Margins of Error

River Basin	Year	Million Tons per Year	Tons per Acre per Year
Arkansas-White-Red	1982	93.7 ±4.4	2.2 ±0.1
	1992	77.0 ±3.9	2.2 ±0.1
	2003	67.4 ±3.4	2.0 ±0.1
California / Great Basin	1982	13.0 ±3.7	1.0 ±0.3
	1992	8.6 ±4.3	0.7 ±0.3
	2003	5.1 ±1.4	0.4 ±0.1
Great Lakes	1982	54.2 ±2.7	2.4 ±0.1
	1992	41.0 ±1.7	1.9 ±0.1
	2003	33.7 ±2.1	1.7 ±0.1
Lower Colorado / Upper Colorado	1982	1.9 ±0.5	0.6 ±0.2
	1992	1.6 ±0.7	0.6 ±0.2
	2003	1.5 ±0.5	0.6 ±0.2
Lower Mississippi	1982	136.4 ±7.9	5.9 ±0.3
	1992	98.9 ±5.2	4.7 ±0.2
	2003	73.9 ±3.4	3.6 ±0.1
Missouri	1982	433.1 ±16.4	4.1 ±0.1
	1992	288.0 ±13.5	3.0 ±0.1
	2003	246.1 ±11.0	2.5 ±0.1

New England / Mid Atlantic	1982	57.3 ±3.5	4.2 ±0.2
	1992	45.7 ±3.0	3.6 ±0.2
	2003	36.3 ±2.4	3.2 ±0.2
Ohio / Tennessee River	1982	189.3 ±7.5	5.3 ±0.2
	1992	128.4 ±5.4	3.8 ±0.1
	2003	94.7 ±4.5	2.9 ±0.1
Pacific Northwest	1982	85.3 ±6.4	4.6 ±0.3
	1992	52.4 ±4.0	3.2 ±0.2
	2003	43.7 ±4.0	2.8 ±0.2
Souris-Red-Rainy / Upper Mississippi	1982	390.7 ±9.3	4.4 ±0.1
	1992	275.2 ±9.0	3.3 ±0.1
	2003	250.8 ±8.8	3.0 ±0.1
South Atlantic-Gulf	1982	145.0 ±7.6	5.4 ±0.3
	1992	91.3 ±6.3	4.3 ±0.3
	2003	62.8 ±3.5	3.4 ±0.1
Texas-Gulf/ Rio Grande	1982	72.0 ±2.6	2.7 ±0.1
	1992	60.8 ±2.6	2.6 ±0.1
	2003	54.5 ±2.6	2.6 ±0.1

Wind Erosion on Cropland by Major River Basin by Year with Margins of Error

River Basin	Year	Million Tons per Year	Tons per Acre per Year
Arkansas-White-Red	1982	212.2 ±18.7	5.1 ±0.4
	1992	118.5 ±13.5	3.3 ±0.3
	2003	90.0 ±11.3	2.7 ±0.3
California / Great Basin	1982	23.3 ±9.1	1.7 ±0.7
	1992	16.8 ±6.7	1.3 ±0.5
	2003	11.7 ±5.8	1.0 ±0.5
Great Lakes	1982	24.1 ±1.7	1.1 ±0.1
	1992	20.1 ±1.8	0.9 ±0.1
	2003	16.4 ±1.7	0.8 ±0.1
Lower Colorado / Upper Colorado	1982	17.4 ±2.2	5.8 ±0.7
	1992	18.3 ±3.6	6.6 ±1.3
	2003	14.5 ±2.8	6.0 ±1.1
Missouri	1982	403.4 ±18.7	3.8 ±0.1
	1992	288.7 ±14.1	3.0 ±0.1
	2003	232.8 ±12.5	2.4 ±0.1
Ohio / Tennessee River	1982	3.6 ±0.8	0.1 ±0.0
	1992	2.5 ±0.7	0.1 ±0.0
	2003	1.4 ±0.4	0.0 ±0.0

Pacific Northwest	1982	60.0 ±9.1	3.2 ±0.5
	1992	58.1 ±9.1	3.6 ±0.5
	2003	51.9 ±7.7	3.3 ±0.5
Souris-Red-Rainy / Upper Mississippi	1982	278.6 ±11.9	3.2 ±0.1
	1992	220.2 ±9.7	2.6 ±0.1
	2003	171.2 ±9.8	2.1 ±0.1
Texas-Gulf/ Rio Grande	1982	367.1 ±28.8	13.5 ±1.1
	1992	242.1 ±23.2	10.3 ±1.0
	2003	186.4 ±16.8	8.8 ±0.8

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